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June 20, 2019

Mr. Ravi Sanga
EPA Remedial Project Manager
U.S. EPA Region 10
1200 Sixth Avenue, ECL 111
Seattle, WA 98101

RE: Former Crucible Cleaning Area Enhanced In Situ Bioremediation String 3 Operations Plan

Dear Mr. Sanga:

This operations plan supplements the U.S. Environmental Protection Agency (EPA) approved *Revised Former Crucible Cleaning Area Enhanced In Situ Bioremediation Work Plan* (Work Plan) from June 2010. As part of the Work Plan, an operations plan (Appendix A) was approved to complete two strings of temporary injection wells for enhanced in situ bioremediation (EISB) with an optional third string of temporary injection wells. Based on observations of injected substrate distribution and water level response during the 2010 injections, the optional third string was not installed. Although the 2010 EISB injection work successfully reduced concentrations of chlorinated volatile organic compounds (CVOCs) throughout the Former Crucible Cleaning Area (FCCA), concentrations of several chlorinated ethanes and ethenes, including TCA, have more recently been detected in some FCCA monitoring wells above cleanup levels.

In EPA's *Fifth Five-Year Review Report for Teledyne Wah Chang Superfund Site, Linn County, Oregon* (FYR) from December 2017, EPA recommended modifications to reduce concentrations of CVOCs in the FCCA. ATI's attached operations plan proposes to implement the optional third string of temporary injection wells (String 3) that was approved by EPA under the Work Plan. Completing String 3 temporary injection wells will help to reestablish reducing conditions in the FCCA and promote EISB reduction of CVOCs.

If you have any questions, please feel free to contact me at 541.812.7376.

Sincerely,

Noel Mak
NPL Program Coordinator

Enclosures: 1. *Former Crucible Cleaning Area Enhanced In Situ Bioremediation String 3 Operations Plan*

Technical Memorandum

To: Noel Mak, ATI Millersburg Operations

From: Andrew Davidson, GSI Water Solutions, Inc.
Renee Fowler, GSI Water Solutions, Inc.

Date: June 20, 2019

Re: **Former Crucible Cleaning Area Enhanced In Situ Bioremediation String 3 Operations Plan**

Introduction

This technical memorandum (TM) presents the Operations Plan that supplements the U.S. Environmental Protraction Agency (EPA) approved June 18, 2010, *Revised Former Crucible Cleaning Area* (FCCA) *Enhanced In Situ Bioremediation* (EISB) *Work Plan* (Work Plan; GSI, 2010) at the ATI Metals (ATI) Millersburg Operations (Site; Figure 1) in Millersburg, Oregon. The Work Plan proposed two strings of temporary injection wells for EISB of chlorinated volatile organic compounds (CVOCs) with an optional third string of injection wells to be installed if deemed necessary. In September 2010, the 10 String 1 temporary injection wells were installed on 6-foot centers in planned locations, while the 6 String 2 temporary injection wells were installed on 10-foot centers using locations selected from the proposed String 2 and String 3 locations. Based on observations of injected substrate distribution and water level response within the adjacent monitoring wells, optional String 3 injection wells were not installed at that time.

Performance groundwater data were collected at FCCA monitoring wells after injections at 4 months (December 2010), 8 months (May 2011), 12 months (October 2011), and 18 months (May 2012). Analyses included (1) CVOC concentrations: 1,1,1-trichloroethane (TCA), trichloroethene (TCE), and associated daughter products; (2) field parameters: specific conductance, temperature, dissolved oxygen (DO), and oxidation reduction potential (ORP); and (3) quantification of dechlorinating bacterial populations: *Dehalococcoides* (Dhc) and *Dehalobacter* (Dhb). Results of the performance monitoring data showed reducing conditions persisted in the FCCA after 18 months, and viable populations of dechlorinating bacteria continued to reduce concentrations of CVOCs in groundwater. Results of the initial performance monitoring were presented in the March 2013 FCCA EISB performance summary report (GSI, 2013).

Performance monitoring data collected in the spring and fall of each year through 2018 show CVOC concentrations remain below the associated cleanup standards in many FCCA wells. Water quality data indicate reducing conditions generally still persist throughout the area.

However, concentrations of several chlorinated ethanes and chlorinated ethenes have been detected above cleanup standards including concentrations of TCA in monitoring wells PW-94A, PW-95A, and PW-100A. Additionally, ORP levels have risen above optimal levels (i.e. -75 millivolts) for reductive dechlorination of CVOCs in the FCCA hot spot monitoring wells (PW-100A, PW-93A, PW-94A, and PW-95A). These data are presented in the 2018 *Fabrication Area Groundwater Remedial Action Progress Summary* (GSI, 2019). To address the ongoing performance monitoring data highlighted in EPA's recommendation #2 of the *Fifth Five-Year Review* (EPA, 2017), ATI will complete the third string of injection wells that are detailed in the Work Plan in the summer months of 2019 (Figure 2). The injections will supplement the initial injection work performed in 2010 and reestablish the reducing conditions favorable for EISB.

This TM provides the details for the field staff to implement the project under the guidance of the approved Work Plan. It is anticipated that changes may be required because of field conditions and observations encountered during the implementation of String 3 temporary injection wells. There have been no changes to the facilities or wells since the Work Plan was approved by EPA.

Implementation Approach

The main operational elements of the project consist of the following activities:

- **Makeup Water Preparation.** Approximately 20,000 gallons of deoxygenated makeup water will be produced for injections. One large or several smaller mixing tanks will be filled with groundwater taken from FCCA extraction well FW-1. Using local groundwater as the makeup water source will provide important benefits including to assist in acclimation of dechlorinating bacteria to native conditions and lower area water levels as a buffer against groundwater mounding from the injections.

  Food-grade sodium lactate and naturally occurring aerobic bacteria will be used to remove oxygen from the water. Field parameters will be assessed until makeup water meets the criteria for optimal Dhc and Dhb growth. CVOC concentrations will be assessed in makeup water before injections as a component of the baseline groundwater monitoring.

- **Baseline Groundwater Monitoring.** Analytical results from the spring 2019 biannual performance monitoring events will be used as the baseline data for the String 3 injections. Groundwater samples collected on a biannual basis from monitoring wells PW-69A, PW-93A, PW-94A, PW-95A, and PW-100A are analyzed for CVOCs and EISB water quality parameters, including alkalinity, sulfate, chloride, nitrate, and dissolved carbon gases (methane, ethane, and ethene [MEE]). Groundwater samples collected from PW-101A and extraction well FW-1 are analyzed for CVOCs (GSI, 2015).

- **EISB.** 8 to 10, 1-inch-diameter temporary injection wells will be installed and screened in the saturated Linn Gravel (i.e., approximately 10 feet below ground surface [bgs] to approximately 25 feet bgs; Figure 3) and inject approximately 2,000 to 2,500 gallons of deoxygenated water into each temporary injection well. The temporary injection wells will be installed as a single string (String 3) on 10-foot centers. A 10-channel injection manifold will be used to meter amendments and bacteria into the deoxygenated water and distribute them to the temporary injection wells.

- **Injection Amendments.** Newman Zone oil substrate will be added to makeup water at approximately 5 percent by volume to serve as an electron donor for the dechlorinating bacteria. Sodium bicarbonate will be added to the makeup water at approximately 125

parts per million (ppm) to buffer the groundwater and keep pH in the optimal range for microbe function and survival.

- **Hydraulic Testing.** Newman Zone substrate will be used to assess substrate distribution. Bailers will be used in select wells for visual observations of substrate dispersal. Groundwater level measurements in nearby monitoring wells will be used to assess the hydraulic response to the injections. Shallow drains and basement in nearby furnace pit will be monitored for potential groundwater breakthrough.
- **Performance Monitoring.** Biannual monitoring data will provide trends in CVOC concentrations and groundwater chemistry in the FCCA after the completion of the injections.

Implementation Tasks

Task 1: Planning and Coordination

Implementation of String 3 injections requires careful logistical planning to ensure the sequence and timing of activities mesh with the subsurface conditions required for biodegradation. Based on past injection experience at the facility, a project construction schedule has been developed focusing on Tasks 1 through 3 and is summarized in Table 1.

Table 1 presents the schedule of when to append underground injection control (UIC) permit #13382, Health and Safety Plans, and pre-drilling utility locates will be completed. Table 2 provides additional information on material suppliers, technical contractors, and key project personnel and contacts.

ATI will provide utility maps and onsite utility location to assist in the selection of appropriate boring locations. GSI Water Solutions, Inc. (GSI), will work with ATI to organize the layout of project facilities to minimize disruptions to facility operations. Final well locations will be marked on the ground at least 1 week before drilling to give ATI personnel sufficient time to confirm utility locations.

GSI will work closely with ATI to ensure that groundwater infiltration does not become a problem in the furnace pit of the Arc Melting Building, which is located north of the planned injections. The furnace pit is designed to direct water to a sump that is equipped with an evacuation pump. This was not an issue in previous injections, but the system will be examined to determine if repairs, upgrades, or modifications are needed to be certain the system is fully operational. A backup evacuation pump or redundant evacuation system will be put into place before commencing injections at the Site.

Task 2: Baseline Sampling and Makeup Water Preparation

Baseline Groundwater Monitoring

Concentrations of CVOCs, dissolved carbon gases (i.e., MEE), and general chemistry (nitrate, chlorine, sulfate, alkalinity) are analyzed by Apex Laboratories in Tigard, Oregon from the following FCCA wells during biannual performance monitoring:

- PW-69A
- PW-93A
- PW-94A
- PW-95A

- PW-100A

Data collected during the biannual performance monitoring event in May 2019 will serve as the baseline monitoring data for the String 3 injections. In addition to the baseline monitoring data collected in May 2019, a sample will be collected at PW-93A and analyzed to enumerate the populations of Dhb and Dhc present before String 3 injections. Makeup water from the mixing tank(s) will be collected for CVOC analysis before String 3 injections. Methods and analyses will conform to the Work Plan.

Makeup Water Preparation

Approximately 20,000 gallons of deoxygenated water for substrate injection will be produced in closed mixing tank(s).

The tank(s) will be sited several weeks before the beginning of injections to allow naturally occurring bacteria time to consume lactate and DO in the tank(s). Initially, approximately 125 ppm of food-grade 60 percent sodium lactate will be added to the tank(s) to stimulate oxygen-consuming biotic activity. A recirculation pump will be used to ensure that lactate and bacteria are well distributed throughout the water column. Makeup water quality parameters (DO, pH, and ORP) will be routinely monitored to determine if additional lactate is required to complete the deoxygenating process. After DO has been reduced to concentrations below 0.2 milligram per liter, argon gas will be used to blanket the top of the tank water surface to retard re-oxygenation of the water before implementation of the String 3 injections.

Before beginning substrate and microbe injections, a makeup water sample will be collected and analyzed for the parameters listed in Table 3. GSI will review makeup water sampling results with the SiREM project manager to confirm that conditions are favorable for the growth and preservation of the KB-1 Plus bacteria. The monitoring requirements for validation of the SiREM KB-1 Plus Guarantee are listed in Table 4.

Task 3: Temporary Well Installation and Injections

Installation Details

The temporary well installations and injections will be completed in accordance with the Work Plan. The ground surface of the FCCA is composed primarily of 24-inch-thick reinforced concrete. ATI will review and identify all utilities in the area before any wells are located at the Site. Injections carried out in 2010 identified relatively shallow chemical drain lines (Figure 2), cooling water return lines, overhead electrical utility lines just east of monitoring well PW-93A, and a natural gas pipeline running through the eastern portion of the FCCA. The drilling contractor was able to maneuver drilling equipment in the area and vehicles were able to access injection well locations. ATI will mark the location of utilities on the ground before concrete coring to allow installation of the wells by the drillers.

The drilling contractor will air-knife, water-knife, or hand auger, all well installation locations to a depth of 5 feet to reduce the likelihood that utilities will be encountered during the well installation process. Soil cuttings will be placed in drums and properly labeled for disposal by ATI.

Temporary injection wells will be installed with Geoprobe direct-push technology using 2 ¼-inch-diameter hollow steel rods advanced to the Spencer Formation (approximately 25 feet bgs; Figure 3). Soil information derived from the installation of monitoring wells PW-100A and PW-101A,

previous characterization probes, existing monitoring wells at the Site, and previous soil investigations will be used to assist placement of the temporary well screens at the top of the Spencer Formation.

The temporary wells will consist of a 1-inch-diameter polyvinyl chloride (PVC) well casing screened in the saturated zone, which is anticipated to be approximately 10 to 25 feet bgs. The wells will be sealed with a bentonite sleeve designed for injection purposes and will be removed entirely at the completion of injections.

Proposed temporary injection well locations are shown in Figure 2. The final well locations will be marked in the field, taking into account project logistics, location of utilities, and ATI operations.

Injection Schedule

The String 3 injection schedule covers 5 days. The need to minimize hydraulic mounding and contaminant migration (i.e., the low flow injection approach) must be balanced with the legal requirement to remove the temporary injection wells within 72 hours, as specified by Oregon Water Resources Department regulations. Additional time has been provided in the schedule to core and install wells at new locations if unanticipated utilities are discovered during the air-knifing before the drilling at planned locations. The following is a summary of the injection schedule:

- **Day 1**: Remove concrete corings.
- **Day 2**: Air-knife or water-knife holes to 5 feet. Install and inject String 3 wells. Injections restricted to low injection volumes and pressures. Observe nearby monitoring wells for evidence of substrate distribution.
- **Day 2 to 4**: Inject 2,000 to 2,500 gallons into each temporary injection well while monitoring hydraulic response in nearby wells. Keep injection pressures generally less than 5 pounds per square inch (psi) and injection volumes to approximately 1.5 gallons per minute (gpm) until monitoring indicates higher values may be tolerated.
- **Day 4**: Remove String 3 temporary injection wells.
- **Day 4 or 5**: If needed, correct any problems encountered during air-knifing or temporary well installations.

Injection Equipment

A 110-volt transfer pump will be positioned at the makeup water tank outlet to provide consistent flow and pressure of deoxygenated water to the pre-injection manifold. Primary flow control will be achieved through the use of a solid flow control orifice located at the pump discharge port to keep system-wide pressures at, or below, 20 psi before the modular injection system discussed below.

Flows from the transfer pump first pass to a pre-injection manifold. The pre-injection manifold is made of clear tubing to assist in detecting and eliminating air bubbles in the injection fluids, and also is plumbed back to the makeup tank(s) for pressure control and relief. Flows from the pre-injection manifold pass directly to a modular injection system, or injection manifold, assembled by Remediation and Natural Attenuation Services, Inc. (RNAS), and consist of the following components:

1. A universal pipe adaptor.

2. Two parallel dosing pumps capable of delivering 5 percent concentrations of Newman Zone.
3. Two siphon lines to the Newman Zone totes.
4. Two mixing and collection manifolds.
5. 10 mechanical flow meters to accurately measure and distribute substrate to each of the 10 temporary injection wells.
6. Clear ¾-inch-inside-diameter braided polyethylene tubing leading to each of the temporary injection wells.
7. Wellhead fittings with oil-filled pressure gauges, air-relief and injection valves, flow control valves, and digital flow meters. Wellhead fittings are made of clear food-grade PVC to allow inspection of injection fluids.

Substrate and KB-1 Plus Injections

The planned injection volume for each temporary injection well is approximately 2,000 to 2,500 gallons. Deoxygenated water in the tank(s) will be amended with a 0.5 percent concentration of sodium bicarbonate to improve buffering in the groundwater. In the modular injection manifold, a 5 percent concentration of Newman Zone substrate will be added with a dosing pump.

Previous injections within the Linn Gravel in 2010 showed that a 15-foot well screen will accept 1.5 gpm of injectate at 5 psi or less. If all 10 injection points are used in String 3, the injection volume for these wells will include approximately 2,000 gallons of makeup water with approximately 1,000 gallons of Newman Zone. At an injection rate of 1.5 gpm, injections will take approximately 24 hours to complete. This is an average injection rate and some temporary injection wells likely will require the full 72 hours.

Each temporary injection well will receive 1.0 liter of KB-1 Plus culture distributed across the injection intervals after a third of the substrate materials has been injected. Microbe injection will be performed by personnel trained by SiREM to perform these injections. The KB-1 Plus injections include the following steps:

- Confirm with SiREM that conditions are suitable for injections.
- Purge delivery tubing with argon gas before releasing bacteria from the storage vessel.
- Use the gas valve to bleed any air in the injection well tubing.
- Exercise care to eliminate exposure of bacteria to air.
- Use a digital scale at the well to deliver an equal fraction of KB-1 Plus culture at each injection interval at each temporary injection well.
- Record all injections on the SiREM KB-1 Plus Injection Records form.

KB-1 Plus injections will be completed according to the detailed specifications provided in the Work Plan by field personnel trained by SiREM to perform the work. Approved injection methods are designed to minimize the mortality of bacteria during the injection process. Bacteria are surrounded by argon gas during the injections and bacteria volumes are carefully weighed and calculated at each temporary injection well.

Substrate Distribution

The goal of the injections is to distribute substrate and microbes equally throughout the area without affecting the nearby Arc Melting Building furnace pit to the north or mobilizing contaminants from the area. This will be accomplished through:

- **Low Injection Rates**. Each temporary injection well will receive 1.5 gpm or less to reduce hydraulic mounding.
- **Low Injection Pressures**. Injection pressures will be kept as low as practical (i.e., less than or equal to 5 psi in each well) to reduce subsurface fracturing and development of preferential pathways.
- **Hydraulic and Substrate Distribution Monitoring.** Nearby monitoring wells will be monitored for hydraulic response and substrate breakthrough. Monitoring well PW-100A will be monitored to access mounding adjacent to the blast wall. Injection periods have been planned with ample time to allow for modifications in injection rates and pressures.

  Shallow utility corridors, catch basins, and the Arc Melting Building sump also will be visually inspected for potential breakthrough of substrate. During active injection periods, the catch basins shown in Figure 2 and the Arc Melting Building basement walls and sump will be inspected, at a minimum, three times a day and more frequently if breakthroughs occur. The presence of substrate in the chemical drain catch basins or the basement sump will require the recovered fluid to be routed to and contained in a separate storage tank to prevent the introduction of substrate into the treatment system.
- **Extraction Well FW-1**. The extraction well will continue to operate during the injection phase, providing hydraulic containment in the area. The extraction well must be shut down if substrate reaches the well to prevent oil from entering the treatment system.

Task 4: Performance Monitoring

Groundwater sampling at monitoring wells will be conducted during biannual performance monitoring events to evaluate the effectiveness of EISB. The monitoring schedule is summarized in Table 1. In addition to analytical sampling, each event will assess field parameters, DO, and ORP to confirm conditions are favorable for microbe survival. Dhb and Dhc bacterial analyses will be performed 8 months after KB-1 Plus injection, as recommended by SiREM. Sampling and analysis will be performed to the same standards described for baseline monitoring and will focus on CVOCs, MEE, and general chemistry at select monitoring wells.

Task 5: Reporting

A TM will be prepared that presents the details of the String 3 temporary well injections and the results of the baseline and performance monitoring. The TM will be completed and submitted to EPA within 60 days of receiving the validated data from the fall of 2020 biannual monitoring event. The data will include results from approximately 2, 8, and 14 months after injections completed in the summer of 2019. ATI will consult with EPA if any further actions are indicated by the results of the post-injection sampling.

References

EPA. 2017. Fifth Five-Year Review Report for Teledyne Wah Chang Superfund Site, Linn County, Oregon. Prepared by U.S. Environmental Protection Agency Region 10, December 2017.

GSI. 2010. Former Crucible Cleaning Area Enhanced In Situ Bioremediation Work Plan, ATI Wah Chang Facility, Albany, Oregon. Prepared by GSI Water Solutions, Inc., June 2010.

GSI. 2013. Former Crucible Cleaning Area Enhanced In Situ Bioremediation Project and Performance Summary, Fabrication Area, ATI Wah Chang Facility, Albany, Oregon. Prepared by GSI Water Solutions, Inc.

GSI. 2015. Quality Assurance Project Plan for Site-Wide Remedial Actions. Prepared by GSI Water Solutions, Inc., December 2015.

GSI. 2019. Fabrication Area Groundwater Remedial Action Progress Summary – Year 2018. Prepared by GSI Water Solutions, Inc., April 2019.

Table 1. String 3 Schedule

ATI Millersburg Operations, Oregon

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 21	Week 45	Week 69	Week 81
Task 1 - Planning and Coordination																		
1A: Project Coordination																		
Schedule driller for temporary injection wells	X	X	X	X														
Complete site-specific HSP				X	X	X												
Submit UIC Permit Application to DEQ				X	X													
Schedule tank deliveries with ATI to FCCA staging area				X	X	X												
Order sodium lactate for makeup tanks		X	X	X														
Schedule delivery of injection supplies from RNAS				X	X													
Order KB-1 Plus bacteria and injection supplies				X	X													
Calibrate and test injection and feed pumps						X	X											
Schedule monitoring instruments for air and water					X													
Confirm all project personnel have site-specific health and safety training	X	X	X	X														
1B: Preliminary Field Tasks																		
Coordinate any remaining Baseline sampling parameters with ATI	X	X																
Order supplies from SiREM to complete baseline DHC/DHB at MW-93A	X	X																
Complete contingency checks for basement of Arc Melting Building						X	X	X	X									
Layout well locations and complete utility checks							X	X										
Coordinate with ATI to mark utilities and well locations for Task 3								X	X	X								
Coordinate with ATI for concrete coring of String 3 injection wells									X	X								
Task 2 - Baseline Sampling and Makeup Water Preparation																		
Coordinate with ATI to collect any remaining baseline data from FCCA wells. Submit samples to Apex							X	X	X									
Site tanks									X									
Fill tanks and begin deoxygenation of water									X									
Plumb for 0.5% sodium bicarbonate mix into tanks									X	X	X							
Plumb for 10:1 Neutral Zone injection through pre-injection manifold										X	X							
Monitor and condition makeup tanks for injections										X	X	X						
Complete baseline monitoring of makeup water											X	X						
Plumb tanks to pre-injection manifold and set up injection system												X						
Tabulate results of baseline monitoring before beginning injections												X						

Table 1. String 3 Schedule

ATI Millersburg Operations, Oregon

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 21	Week 45	Week 69	Week 81
Task 3 - Temporary Well Installation and Injections																		
Coordinate with ATI for marking and coring of injection points										X	X	X						
Remove concrete plugs and air-knife boreholes for obstructions/utilities										X	X	X						
(Day 1 to 3): install 8 to 10 String 3 injection wells and plumb for injection (1" x ~25' with 15' screen) bentonite injection sleeve and concrete temporary well seal. Inject 2,000-2,500 gallons of deoxygenated water with buffer and 5% neutral zone per well over two-three daylight intervals. Inject 1.0L KB-1+ per well after ~700 gallons												X	X					
(Day 4-5): remove String 3 temporary wells and abandon boreholes appropriately													X					
Clean, decon, demob, package, ship, and store equipment and supplies													X	X				
Task 4 - Performance Monitoring																		
Groundwater monitoring at 2, 8, and 14 months coinciding with biannual performance monitoring events (see Table 4 for analyses)															X	X	X	
DHC/DHB enumeration done at PW-93A at 8 months																X		
Task 5 - Reporting																		
Data processing, recordkeeping, intermediate analysis at 2, 8, and 14 months with client															X	X	X	
Prepare technical memorandum summarizing EISB results 3 months after completion of 14-month																		X

Notes:

Apex = Apex Laboratories

DEQ = Oregon Department of Environmental Quality

Dhb = *Dehalobacter*

Dhc = *Dehalococcoides*

EISB = enhanced in situ bioremediation

FCCA = former crucible cleaning area

HSP = health and safety plan

RNAS = Remediation and Natural Attenuation Services, Inc.

UIC = underground injection control

Table 2. Roles and Contact Information

ATI Millersburg Operations, Oregon

Name	Company	Role	Email	Phone
Noel Mak	ATI	Site NPL Program Coordinator	noel.mak@atimetals.com	541.990.7985 (O) (b) (6) (M)
Ravi Sanga	EPA	Remedial Project Manager	Sanga.Ravi@epamail.epa.gov	206.553.4092
Renee Fowler	GSI	Contracting Project Manager	rfowler@gsiws.com	971.200.8511 (O) (b) (6) (M)
Andrew Davidson	GSI	Remediation Engineer	adavidson@gsiws.com	971.200.8535 (O) (b) (6) (M)
Peter Pellegrin	GSI	Field Operator	--	(b) (6) (M)
ATI Guard	ATI	Emergency Contact	--	541.812.7177
Brian Osborne	Rain for Rent	Makeup Tank Vendor	BOSBORNE@rainforrent.com	(b) (6) (M)
Bill Newman	RNAS	EVO and Equipment Vendor	info@RNASinc.com	763.585.6191 (O) (b) (6) (M)
Joe Goff	RNAS	EVO and Equipment Vendor	JGoff@rnasinc.com	763.585.6191 (O) (b) (6) (M)
Jeff Roberts	SiREM	KB-1 Plus Vendor	JRoberts@siremlab.com	519.822.2265
Jeff Zachman	Cascade Columbia Distrubtion	Sodium Bicarbonate Vendor	jeffz@cascadecolumbia.com	971.253.9215
Lisa Domenighini	Apex Laboratories	Laboratory Services Manager	LDomenighini@APEX-LABS.com	503.718.2323 (O) (b) (6) (M)

Notes:

O = office

M = mobile

Table 3. FCCA Sampling Program

ATI Millersburg Operations, Oregon

Location	Frequency	Sampling Program	Notes
Makeup Water Tanks			
Makeup water during deoxygenation	Weekly	Field Parameters[1]	Continue until makeup water meets SiREM Criteria
Makeup water before injection	One time before use	SiREM Criteria[2] Baseline Lab Parameters (CVOCs only)[3]	To document makeup water condition
Baseline Groundwater Monitoring			
PW-93A, PW-94A, PW-69A, PW-95A, and PW-100A	One time before to injection	Field Parameters[1] SiREM Criteria[2] Baseline Lab Parameters[3]	May be collected as part of annual monitoring
PW-93A	One time before substrate injection	Bacteria[4]	For comparison with post-injection bacteria analyses
Performance Monitoring			
PW-93A, PW-94A, PW-69A, PW-95A, and PW-100A	2 months, 8 months, and 14 months after injection	Field Parameters[1] Baseline Lab Parameters[3]	To evaluate long-term trends in CVOC degradation patterns
PW-93A	8 months	Bacteria[4]	To evaluate bacteria populations

Notes:

[1] Field Parameters = dissolved oxygen (DO), oxidation reduction potential (ORP), pH, specific conductance, and temperature.

[2] SiREM Criteria = DO, ORP, pH, and sulfate

[3] Baseline Lab Parameters = chlorinated volatile organic compounds (CVOCs), methane/ethane/ethene (MEE), alkalinity, total organic carbon (TOC), sulfate, nitrate, and chloride

[4] Bacteria = *Dehalococcoides/Dehalobacter*

FCCA = former crucible cleaning area

Table 4. SiREM Guarantee Monitoring Requirements

ATI Millersburg Operations, Oregon

Parameter	Target	Pre-Bioaugmentation	Post-Bioaugmentation
pH	6.0 - 8.5	X	X
Chlorinated ethenes (PCE, TCE, cis-DCE, VC)	> 100 µg/L	X	X
1,1,1-Trichloroethane	< 200 µg/L	X	X
Chloroform	< 50 µg/L	X	X
Dissolved hydrocarbon gases (methane, ethane, ethene)	NA	X	X
Dissolved oxygen	< 0.2 mg/L	X	X
Oxidation reduction potential	< -75 mV	X	X
Sulfate	< 1,000 mg/L	X	
Dehalococcoides organisms	NA		X

Notes:

µg/L = micrograms per liter

DCE = dichloroethene

mg/L = milligrams per liter

mV = millivolt

NA = not applicable

PCE = tetrachloroethene

TCE = trichloroethene

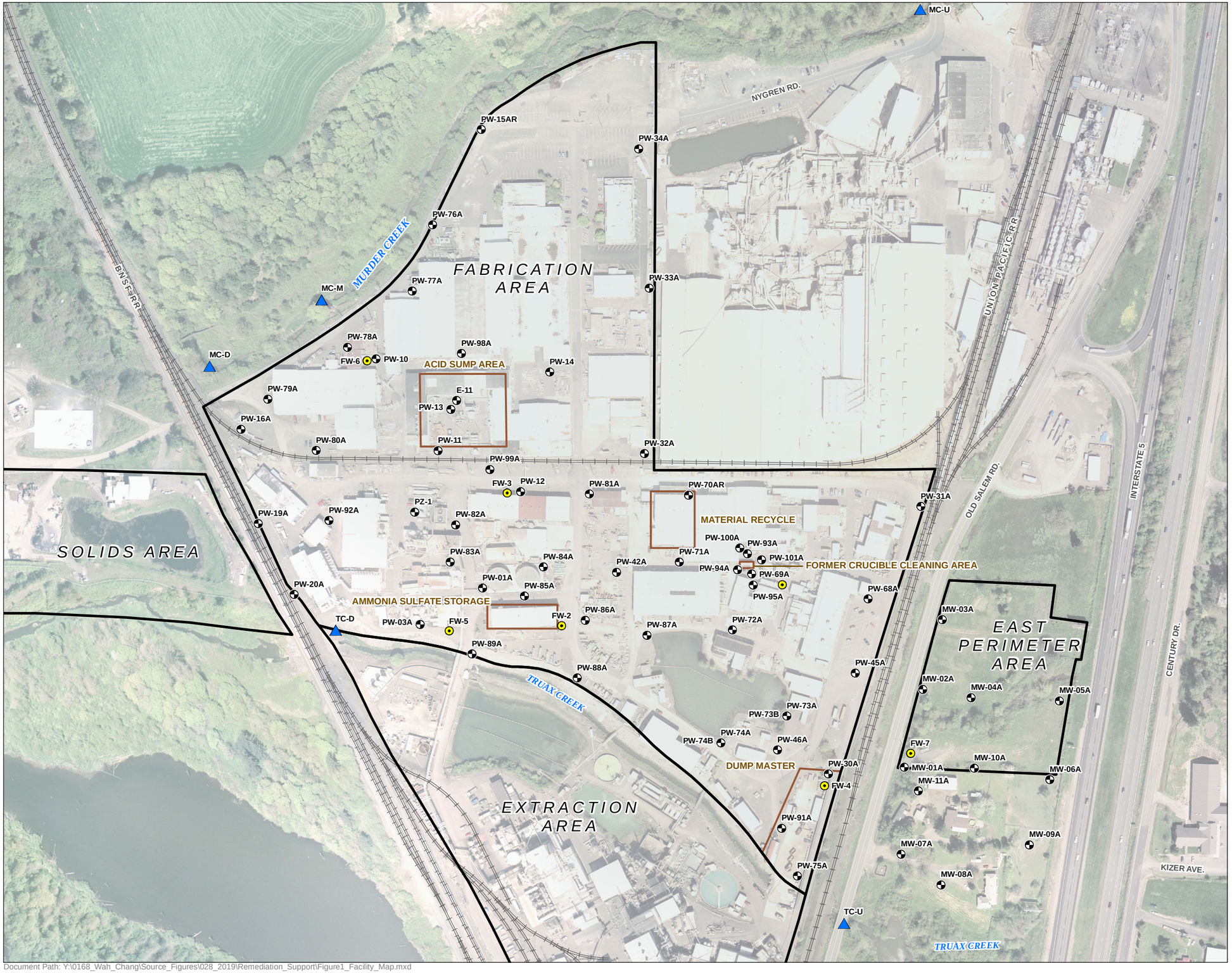
VC = vinyl chloride

X = analysis is required for validation of guarantee

FIGURE 1

Facility Map

ATI Millersburg Operations, Oregon



LEGEND

- Monitoring Well
- Extraction Well
- Surface Water Sample Location
- Remediation Area
- Site Boundary
- Railroad

NOTE:
TMW-1 and TMW-4 removed August 2016. I-2, I-3, EI-5 added to monitoring network in fall of 2016.

N

0 125 250 375
Feet

Date: June 7, 2019
Data Sources: Wah Chang, City of Albany GIS

GSI Water Solutions, Inc.

Document Path: Y:\0168_Wah_Chang\Source_Figures\028_2019\Remediation_Support\Figure1_Facility_Map.mxd

FIGURE 2

Former Crucible Cleaning Area Injection Augmentation Summary Summer 2019

ATI Millersburg Operations, Oregon

LEGEND

- Proposed 2019 Temporary Injection Well - String 3
- Monitoring Well
- Extraction Well
- 2010 Injection Well Location
- Refusal at Installation Point
- Utility at Installation Point
- Chemical Drain Basins to Waste Water Treatment (Approximate)
- Injection Tubing
- Chemical Drain Line
- Water Supply
- 5-foot Theoretical Radius of Influence

NOTE:
Temporary injection well locations may be adjusted in field to accommodate utilities, infrastructure, or points of refusal.

N

0 10 20 30
Feet

Date: June 20, 2019
Data Sources: ATI, City of Albany GIS

GSI Water Solutions, Inc.

Document Path: Y:\0168_Wah_Chang\Source_Figures\028_2019\Remediation_Support\Figure2_CCA_Injection_Augmentation_Summary.mxd

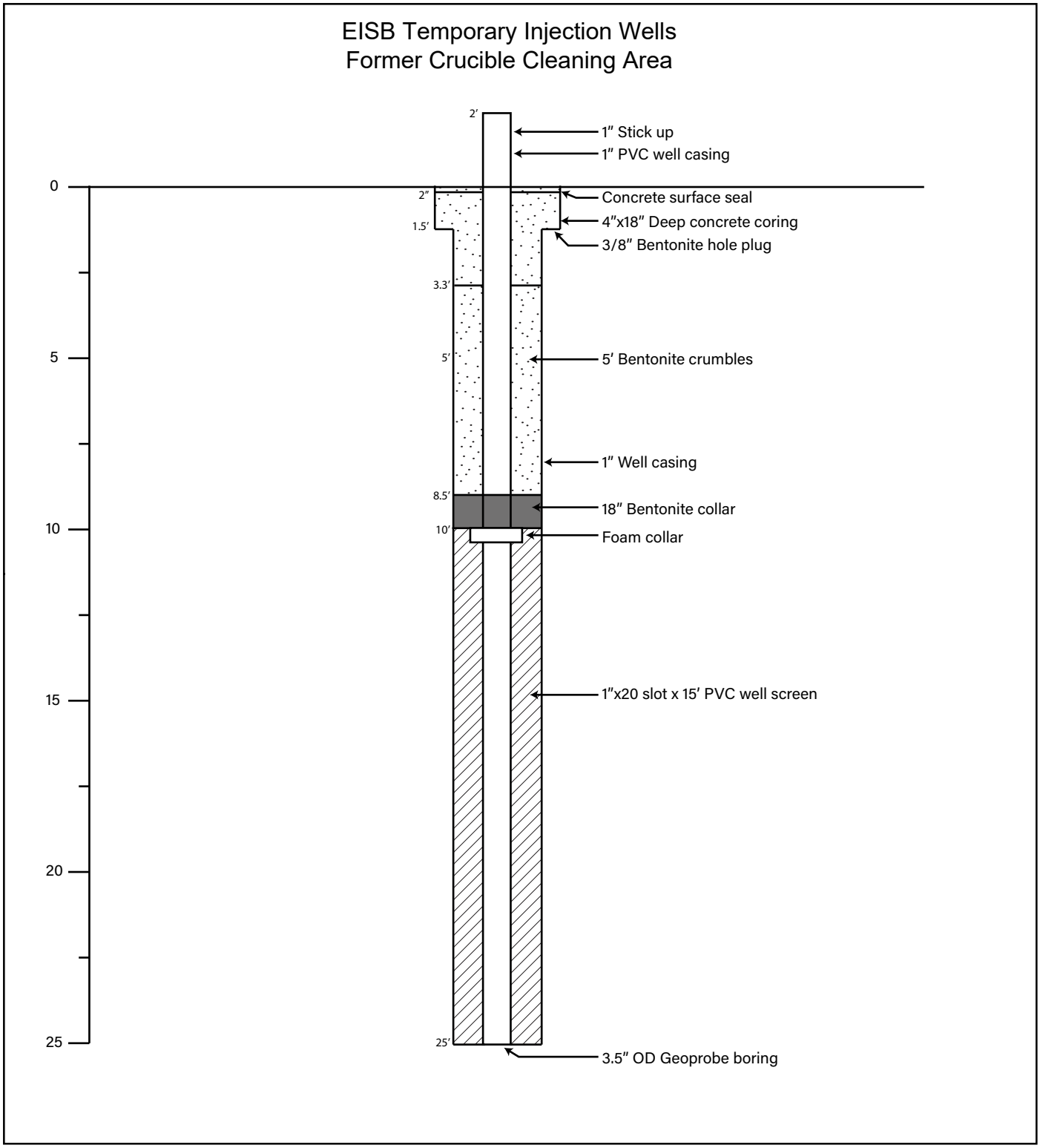


FIGURE 3

EISB Temporary Injection Wells

ATI Millersburg Operations, Oregon

Date: June 7, 2019

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